

A new termite bug in Miocene amber from the Dominican Republic (Hemiptera, Termitaphididae)

Michael S. Engel

Division of Entomology, Natural History Museum, and Department of Ecology & Evolutionary Biology, University of Kansas, Lawrence, USA

urn:lsid:zoobank.org:author:3714A7FF-E19E-495A-AAF9-98D2F597B757

Corresponding author: *Michael S. Engel* (msengel@ku.edu)

Academic editor: *Jes Rust* | Received 04 September 2009 | Accepted 12 October 2009 | Published 23 October 2009

urn:lsid:zoobank.org:pub:76B0B285-3584-4584-8E83-2CA543211D06

Citation: Engel MS (2009) A new termite bug in Miocene amber from the Dominican Republic (Hemiptera, Termitaphididae). ZooKeys 25: 61–68. doi: 10.3897/zookeys.25.267

Abstract

A new species of the termite bug genus *Termitaradus* Myers (Aradoidea: Termitaphididae) is described and figured based on a single female preserved in Early Miocene (Burdigalian) amber from the Dominican Republic. *Termitaradus mitnicki* **sp. n.** differs from the only other termitaphidid in Dominican amber, *T. avitinquilinus* Grimaldi and Engel, in the integumental ornamentation, number of laminae and lobules, body proportions, and setation. This is the third species of fossil Termitaphididae discovered. A revised key to living and fossil termitaphidids is provided.

Keywords

Prosorrhyncha, Heteroptera, Pentatomomorpha, Aradoidea, inquiline, Tertiary, paleontology, West Indies

Introduction

The nests of highly eusocial insects are seething with a diversity of associated arthropods, all evolved to take advantage of the rich resources provided by these ubiquitous and ecologically impressive species. Among the more unusual of inquiline arthropods to evolve in conjunction with their eusocial hosts are those species of

the aradoid family Termitaphididae (Hemiptera: Heteroptera: Pentatomomorpha). Termitaphidids, as their name suggests, are obligate inquilines in the nests of termites, particularly those of the families Termitidae and Rhinotermitidae. Termitaphidids are typically small (2–4 mm in length, although some fossils can be as large as 5.5–7 mm), ovoid, and generally dorsoventrally compressed, with flattened lateral laminae extending from each segment. The family currently comprises two genera, *Termitaphis* Wasmann, a monotypic genus known from Colombia, and *Termitaradus* Myers, with eight living species in South and Central America, tropical Africa, Asia, and Australia. Although classified as a separate family, it is possible that termitaphidids are highly derived mezirine Aradidae, some of which have structures similar to Termitaphididae and several of which are termitophiles (Grimaldi and Engel, 2008). The most detailed accounts of termitaphidid biology are those of Myers (1924, 1932).

Two species of termitaphidids, both of the genus *Termitaradus* and known only from females, have been discovered in New World Tertiary ambers. *Termitaradus avitinquilinus* Grimaldi and Engel was described from Early Miocene Dominican amber and is generally similar to modern species in its overall proportions, but differs most notably in the number of laminar lobules as well as the structure of the flabella (Grimaldi and Engel 2008). *Termitaradus protera* Poinar and Doyen shares some similarities in lobule number with *T. avitinquilinus* by comparison to modern species, but is particularly noteworthy for its “gigantic” size (Poinar and Doyen 1992), which at 7.1 mm is nearly twice the length of previously described species. Hosts for these fossil species are unknown, although *T. avitinquilinus* is likely associated with *Mastotermes electrodominicana* Krishna and Grimaldi (Mastotermitidae) as two specimens were found in association with a worker of that species (Grimaldi and Engel 2008). This is noteworthy in that as far as has been documented modern termitaphidids are only associated with Neoisoptera (*sensu* Engel et al., 2009) of the families Rhinotermitidae (hosts for species of the genus *Termitaradus*) and Termitidae (hosts for the sole species of *Termitaphis*) (Wasmann 1902; Silvestri 1911, 1921; Mjöberg 1914; Morrison 1923; Myers 1924, 1932; Usinger 1942). Given how little termitaphidids have been studied there are likely a number of new species to be discovered and many elements of their biology remaining to be elucidated, perhaps including yet unsuspected host associations. Since the scant available information indicates an association between termitaphidids and Rhinotermitidae and Termitidae, and that these two termite families are so diverse in Dominican amber (Krishna and Grimaldi 2009), it is perhaps not surprising that a second species of termitaphidid has been discovered in this deposit (Fig. 1). Herein I provide a description of this new species as well as modified keys to the identification of living and fossil Termitaphididae.

Morphological terminology and format for the description generally follows that of Grimaldi and Engel (2008). Measurements were made using an ocular micrometer on an Olympus SZX-12 stereomicroscope.

Systematic Paleontology

Family Termitaphididae Myers, 1924

Genus *Termitaradus* Myers, 1924

Termitaradus mitnicki Engel, sp. n.

urn:lsid:zoobank.org:act:468CF2DC-81E4-40B3-911D-F52F3170D6CE

Figs 1–2

Holotype. ♀, KU-DR-023. Deposited in the Fossil Insect Collection, Division of Entomology, University of Kansas Natural History Museum, Lawrence, Kansas, USA.

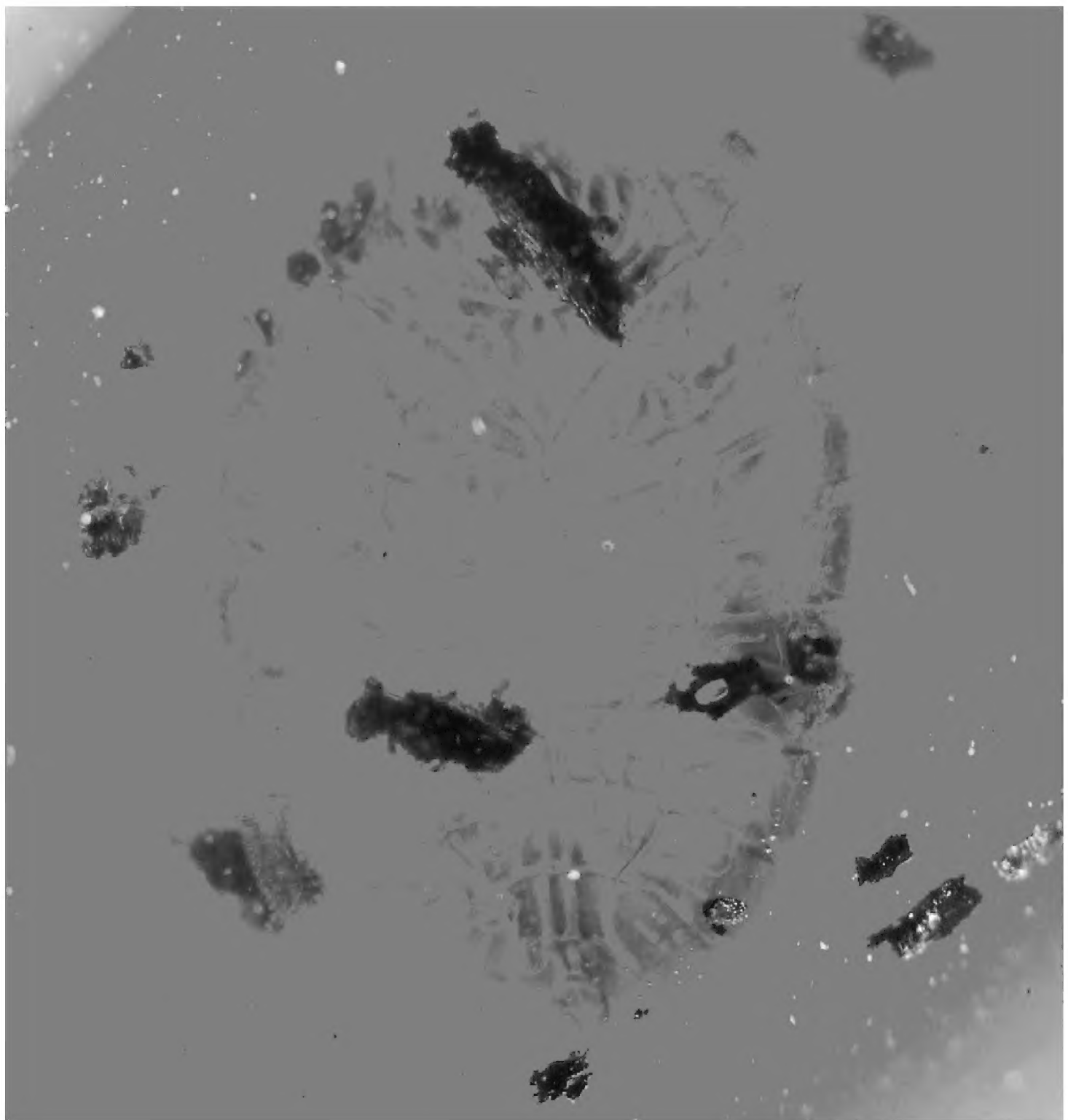


Figure 1. *Termitaradus mitnicki* sp. n. (KU DR-023), photomicrograph of female holotype, dorsal aspect (length of specimen 5.8 mm).

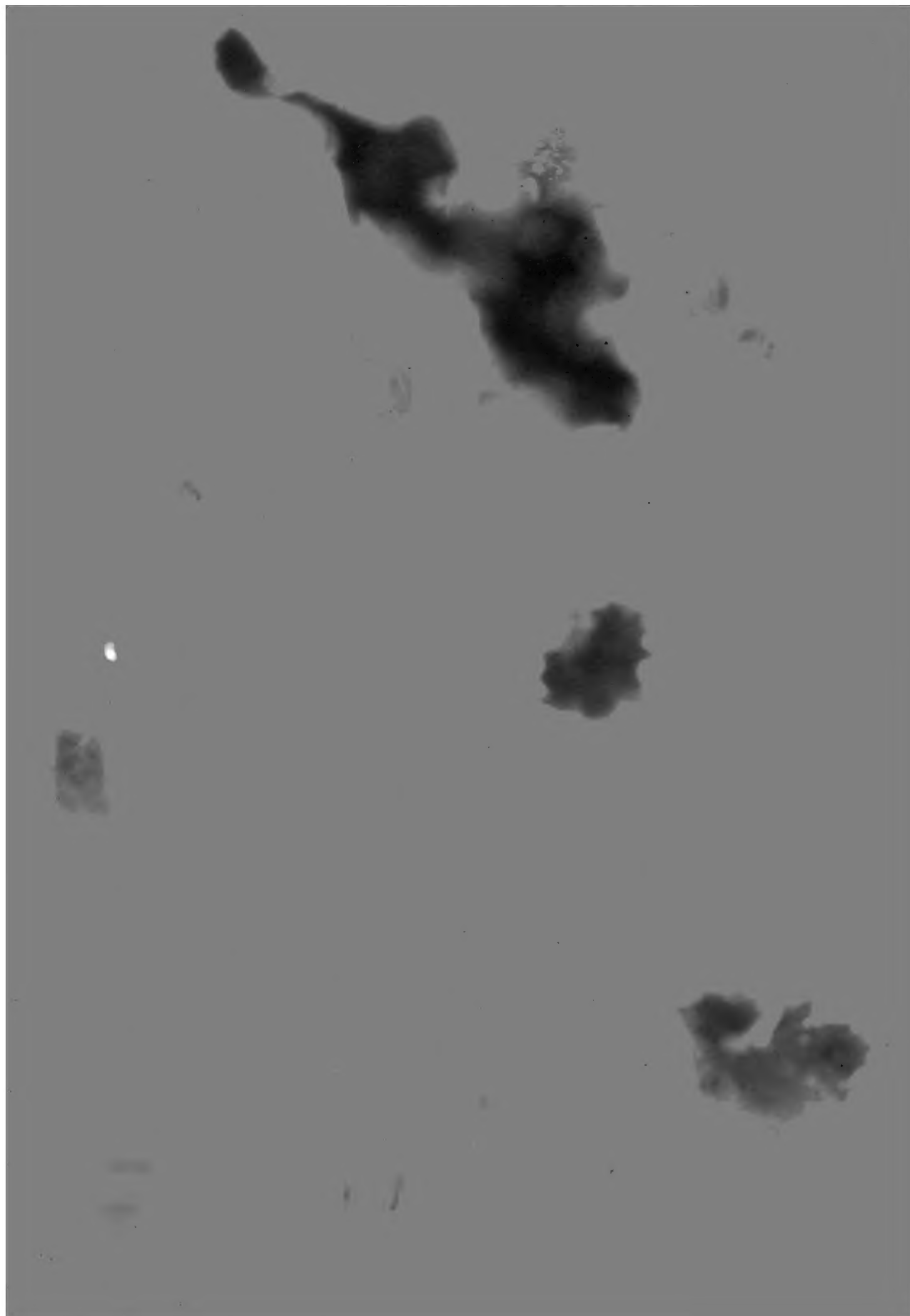


Figure 2. *Termitaradus mitnicki* sp. n. (KU DR-023), photomicrograph of female holotype, ventral aspect showing genitalia (length of specimen 5.8 mm).

Diagnosis. The new species is immediately distinctive for the network of dorsal, segmentally-arranged carinae (Fig. 1) and the absence of the small globular nodule-like setae of other species. The species is larger than most other termitaphidids (2–4 mm), approximating in size the anomalously large *T. protera* in Mexican amber (5.8 mm vs. 7 mm). Like the other two fossil species, *T. mitnicki* shares a greater number of lobules (4) on the terminal abdominal segment, whereas modern species have only 2–3. The number of lobules on most abdominal segments is greater than in any other species, living or fossil, of termitaphidid.

Description. *Female (adult):* Total length 5.8 mm, maximal width 4.0 mm (length/width ratio 1.45). Integument generally reddish brown, although paler on sterna and on dorsal carinae (Fig. 1), lobules largely reddish brown although slightly lighter than body of laminae, apices of lobules more weakly sclerotized, paler than remainder; marginal setae typically pale yellow brown although some cleared, faint (the latter owing to preservation); ventrally faintly imbricate except longitudinally wrinkled on sterna (Fig. 2), with mediolateral areas glabrous, without punctures; dorsally imbricate without punctures, with distinct and complex network of thick carinae arranged segmentally (Fig. 1), such carinae not extending onto laminae (Fig. 1), without setae. Antenna four-segmented, geniculate; first article elongate, length slightly longer than combined lengths of remaining articles combined; remaining articles short, cylindrical, apicalmost apparently slightly swollen (challenging to see in specimen). Labium three-segmented, basalmost segment much shorter than others; second longest, third approximately three-quarters length of second.

Legs with stout femora, greatest widths of femora 2.5–4× times width of tibiae; femora with widely scattered short setae on outer and inner surfaces; mesofemur ventrally with longitudinal row of 3–4 stiff, erect setae at about three-quarters length; metafemur with 4–5 long, fine, erect setae at about four-fifths length; tibiae with scattered short setae along lengths, particularly on outer surfaces, apically with patches of moderately dense, stiff setae; tarsi dimerous, basal tarsomere one-fourth to one-fifth length of apical tarsomere; pretarsal ungues (= claws) large, simple, without teeth; pulvilli present, slender, straplike, lengths nearly as long as that of pretarsal ungues.

Marginal setae of laminae generally subtriangular to lanceolate in form, apparently with serrate margins, none clavate. Thirteen marginal laminae present [two for head, first distinctly larger than, almost twice as large as, second and with narrow separation; three for thorax (one lobule per thoracic segment); and one each for the eight abdominal segments, seventh and eighth the smallest, seventh slightly less than one-half that of first, eighth about one-fifth that of first (Fig. 2)]. Laminae with lobules arranged as follows: 15 (head I), 5–6 (head II), 18 (prothorax), 16 (mesothorax), 12 (metathorax), 14 (abdominal I), 15–16 (abdominal II), 15–16 (abdominal III), 17–18 (abdominal IV), 15–16 (abdominal V), 14–15 (abdominal VI), 8 (abdominal VII), and 4 (abdominal VIII).

Male: Unknown.

Etymology. The specific epithet is a patronym honoring Mr. Tyler Mitnick, nephew of Keith Luzzi who generously located and donated this fine specimen for study.

Key to adult females of Termitaphididae

The following key is updated and modified from the one provided by Usinger (1942).

1. Body egg-shaped, surrounded by a strongly incurved and upcurved, dorso-lateral, segmentally divided lamina, the edges of which are further divided into distinct, often quite distantly separated lobules, each with a long, fine almost smooth flagellum [Colombia; host: *Amitermes foreli* Wasmann (Termitidae: Termitinae)] ***Termitaphis circumvallata* Wasmann**
- Entire body strongly flattened above and below and surrounded by a flat, lateral, segmentally divided lamina, the margin of which is crenulate, forming short, non-separated lobules, each provided with a short, circular, clavate, or lanceolate flabellum with serrate edges [Tropicopolitan; Genus *Termitaradus* Myers; hosts, where known: Rhinotermitidae] **2**
2. Dorsal integument imbricate and granular, with scattered globular nodule-like setae; without raised pattern of carinae **3**
- Dorsal integument imbricate with network of raised, thick carinae forming distinctive network, such carinae not extending onto laminae (Fig. 1) [Dominican amber; host: unknown] ***T. mitnicki* sp. n.**
3. Flabella short and rounded, at most scarcely more than twice as long as broad **4**
- Flabella elongate, much more than twice as long as broad **8**
4. Eighth abdominal lobes each with two or three lobules; anterior abdominal segments with 7–10 lobules on each side; size small (2–3.5 mm in length) **5**
- Eighth abdominal lobes each with four lobules; anterior abdominal segments with at least 12 lobules on each side; size large, over 7 mm in total length [Mexican amber; host: unknown] ***T. protera* Poinar & Doyen**
5. Eighth abdominal lobes each with two lobules; anterior abdominal segments normally with seven or more lobules on each side **6**
- Eighth abdominal lobes each with three lobules on each side **7**
6. Flabella rounded; anterior abdominal segments with not more than seven lobules on each side [México; host: *Heterotermes tenuis* (Hagen) (Heterotermitinae)] ***T. mexicana* (Silvestri)**
- Flabella short, clavate; anterior abdominal segments with eight or more lobules on each side [India; host: *Coptotermes heimi* (Wasmann) (Coptotermitinae)] ***T. annandalei* (Silvestri)**
7. Flabella of second cephalic lobe half the size of other head and body flabella, but projecting conspicuously, ovate in form [Guyana; hosts: *Heterotermes crinitus* (Emerson) & *H. tenuis* (Hagen) (Heterotermitinae)] ***T. guianae* (Morrison)**
- Flabella of second cephalic lobe much smaller, minute, scarcely surpassing margins, perfectly circular in form [Jamaica; host: *Heterotermes convexitatus* (Snyder) (Heterotermitinae)] ***T. jamaicensis* Myers**
8. Eighth abdominal lobes each with two or three lobules **9**

- Eighth abdominal lobes each with four lobules [Dominican amber; putative host: *Mastotermes electrodominicana* Krishna & Grimaldi (Mastotermitidae)]..... ***T. avitinquilinus* Grimaldi & Engel**
- 9. Eighth abdominal lobes each with two lobules..... **10**
- Eighth abdominal lobes each with three lobules..... **11**
- 10. Flabella long, narrow, clavate, with straight sides and squarely truncate tips, not echinate; anterior abdominal lobes each with eight or more lobules [Australia; host: *Coptotermes acinaciformis* (Froggatt) (Coptotermitinae)] ***T. australiensis* (Mjöberg)**
- Flabella subcylindrical, rounded at apices or at most very obtusely pointed, echinate; anterior abdominal lobes each with seven lobules [Africa; host: *Schedorhinotermes putorius* (Sjöstedt) (Heterotermitinae)] ***T. subafra* (Silvestri)**
- 11. Flabella lanceolate, very acute at apices [Panamá; hosts: *Heterotermes tenuis* (Hagen) & *H. convexinotatus* (Snyder) (Heterotermitinae)] ***T. panamensis* Myers**
- Flabella moderately clavate, rounded at apices [Trinidad & Tobago; host: *Heterotermes tenuis* (Hagen) (Heterotermitinae)] ***T. trinidadensis* (Morrison)**

Acknowledgements

The author is grateful to Keith Luzzi for making this material available for study and for permitting its deposition in the Division of Entomology's research collection, and to two anonymous reviewers for their thoughtful commentary on the manuscript. This is a contribution of the Division of Entomology, University of Kansas Natural History Museum.

References

- Engel MS, Grimaldi DA, Krishna K (2009) Termites (Isoptera): Their phylogeny, classification, and rise to ecological dominance. *American Museum Novitates* 3650: 1–27.
- Grimaldi DA, Engel MS (2008) A termite bug in Early Miocene amber of the Dominican Republic (Hemiptera: Termitaphididae). *American Museum Novitates* 3619: 1–10.
- Krishna K, Grimaldi DA (2009) Diverse Rhinotermitidae and Termitidae (Isoptera) in Dominican amber. *American Museum Novitates* 3640: 1–48.
- Mjöberg E (1914) Preliminary description of a new representative of the family Termitocoridae Silv. *Entomologisk Tidskrift* 35: 98–99.
- Morrison H (1923) On three apparently new species of *Termitaphis* (Hem. Het.). *Zoologica* 3(20): 403–408.
- Myers JG (1924) On the systematic position of the family Termitaphididae (Hemiptera, Heteroptera), with a description of a new genus and species from Panama. *Psyche* 31(6): 259–278.

- Myers JG (1932) Observations on the family Termitaphididae (Hemiptera-Heteroptera) with the description of a new species from Jamaica. *Annals and Magazine of Natural History, Series 10*, 9: 366–372.
- Poinar GO, Jr, Doyen JT (1992) A fossil termite bug, *Termitaradus protera* sp. n. (Hemiptera: Termitaphididae), from Mexican amber. *Entomologica Scandinavica* 23(1): 89–93.
- Silvestri F (1911) Sulla posizione sistematica del genere *Termitaphis* Wasm. (Hemiptera), con descrizione di due specie nuove. *Bolletino del Laboratorio di Zoologia Generale ed Agraria, Portici* 5: 231–236.
- Silvestri F (1921) A new species of *Termitaphis* (Hemiptera-Heteroptera) from India. *Records of the Indian Museum* 22: 71–74.
- Usinger RL (1942) Revision of the Termitaphididae (Hemiptera). *Pan-Pacific Entomologist* 18(4): 155–159.
- Wasmann E (1902) Species novae insectorum termitophilorum ex America meridionali. *Tijdschrift voor Entomologie* 45: 75–107.